Image AF/2817

Patent Application No. 09/995,205
Attorney Docket No. 81716.0081

OIPE FEB 18 2004 JC68 PATENT & TRADEMARK OFFICE

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Takeshi OKAMURA, et al.

Serial No: 09/995,205

Filed: November 26, 2001

For: NON-RADIATIVE DIELECTRIC WAVEGUIDE AND MILLIMETER WAVE TRANSMITTING/RECEIVING APPARATUS

Art Unit: 2817

Examiner: Kimberly E. Glenn

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Assistant Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450, on

February 13, 2004
Date of Deposit

Diane Zynn
Name

Diane Zynn 02/13/04
Signature Date

**TRANSMITTAL LETTER**

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Assistant Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Please find enclosed an original plus 3 copies of the Appeal Brief together with a check in the amount of $330 as filing fee for the Appeal Brief.

If for any other reason an insufficient fee has been paid, please charge any insufficiency to Deposit Account No. 50-1314. A copy of this petition is enclosed.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date: February 13, 2004

By: Lawrence J. McClure
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## APPEAL BRIEF

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Dear Sir:

This is an Appeal from the Examiner's Final Rejection of claims 1-5. The Final Rejection issued on August 15, 2003 and the Notice of Appeal was received in the Patent and Trademark Office on November 14, 2003. The Appeal Brief was therefore initially due on January 14, 2004. A petition for a one-month extension of the period for response is enclosed, extending the time for filing the opening brief to February 14, 2004. Hence, this appeal brief is timely filed. The Commissioner is authorized to charge any deficiency in any fee or credit any excess payment to Deposit Account No. 50-1314.

## REAL PARTY IN INTEREST

The real party in interest is Kyocera Corporation, Kyoto, Japan.

## RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

## STATUS OF CLAIMS

Claims 1-17 are pending. Claims 6-17 have been determined to be allowable. This Appeal is directed to the final rejection of claims 1-5, a copy of which appears as an Appendix to this Appeal Brief.

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In the NRD guide realized by using a dielectric strip formed of a conventionally-used dielectric material having a relative dielectric constant of 2 to 4, such as Teflon or polystyrene, there is a transmission loss at a curved portion (to be simply called bending loss) or a transmission loss in a strip conjugating portion is

great. This makes it impossible to provide a sharp curved portion. Moreover, even in a case where a gently-curved portion is formed, its radius of curvature needs to be determined precisely. (Applicant's specification, at p. 2, line 2-p. 3, line 4).

In addition, in an NRD guide realized by using a dielectric strip formed of a conventionally-used resin material such as Teflon, the dielectric strip and the parallel planar conductor cannot be bonded to each other with ease. Consequently, the dielectric strip is positionally deviated due to vibration or difference in thermal expansion, which results in malfunction. (Applicant's specification, at p. 3, line 21-p. 4, line 1).

Accordingly, it is an object of the present invention to provide a high-performance NRD guide which offers excellent reliability and suffers little from high-frequency signal transmission loss, and in which, since conversion of an electromagnetic wave of a longitudinal section magnetic mode (an "LSM mode") into a longitudinal section electric (an "LSE mode") is minimized, a sharp curved portion capable of dealing with a wide usage frequency range despite having a smaller radius of curvature can be formed in the dielectric strip, and consequently the millimeter wave integrated circuit in which it is incorporated can be made compact. (Applicant's specification, at p. 5, lines 15-24).

The invention provides a non-radiative dielectric waveguide comprising:

a pair of parallel planar conductors arranged at an interval of half or below of a high-frequency signal wavelength; and

a dielectric strip interposed between the parallel planar conductors, the dielectric strip having a 0.01 to 0.3 mm-wide chamfer formed at an edge portion in a transmission direction of the dielectric strip,

wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar. (Applicant's specification, at p. 6, lines 4-11; Figs. 6A-B).

According to the invention, in the non-radiative dielectric waveguide, the dielectric strip has a 0.01 to 0.3 mm-wide chamfer 2a formed at its edge portion in a direction in which high-frequency signals are transmitted. Thus, when one surface of the dielectric strip facing to the parallel planar conductor is bonded to the parallel planar conductor with adhesive, the adhesive spreads over the chamfer, resulting in an increase in the bonding area. This allows the dielectric strip to be bonded firmly to the parallel planar conductor, thereby obtaining excellent durability. Moreover, the adhesive existing in the chamfer serves to alleviate adverse effects such as thermal expansion or shock. This helps protect the central portion of the dielectric strip, onto which electric fields of high-frequency signals (electromagnetic waves) to be transmitted are concentrated, against deformation. Consequently, transmission loss in high-frequency signals can be effectively suppressed. In this way, a high-performance non-radiative dielectric waveguide can be realized that is highly reliable and incurs lower loss. (Applicant's specification, at p. 6, line 12-p. 7, line 5).

In the invention, it is preferable that the chamfer is formed as a flat surface, and one width of the chamfer corresponding to a surface of the dielectric strip facing to the parallel planar conductor is made larger than the other width corresponding to a side surface of the dielectric strip. (Applicant's specification, at p. 7, lines 6-10).

In the invention, it is preferable that the chamfer is formed as a convexly-curved surface, and one width of the chamfer corresponding to the surface of the dielectric strip facing to the parallel planar conductor is made larger than the other width corresponding to the side surface of the dielectric strip. (Applicant's specification, at p. 7, lines 11-15).

Another aspect of the present is to provide a non-radiative dielectric waveguide comprising:

a pair of parallel planar conductors arranged at an interval of half or below of a high-frequency signal wavelength; and

a dielectric strip interposed between the parallel planar conductors, the dielectric strip being made of a ceramics having an open pore ratio of 5 % or less,

wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar. (Applicant's specification, at p. 7, lines 16-22; Figs. 6A-B).

In the invention, it is preferable that the dielectric strip has an open pore ratio of 3 % or less. (Applicant's specification, at p. 7, lines 23-24).

In the non-radiative dielectric waveguide embodying the invention, the open pore ratio of the dielectric strip is set at 5 % or less. This prevents, during the process steps for the dielectric strip, impurities, which are generated during the process, from being attached to the strip surface, and also prevents the strip surface from adsorbing moisture due to humidity of atmosphere. Consequently, transmission loss in high-frequency signals is minimized. Eventually, a high-performance non-radiative dielectric waveguide can be realized that is highly reliable and incurs lower loss. (Applicant's specification, at p. 6, line 12-p. 7, line 5).

ISSUES

There are two issues on Appeal:

I. Whether the Final Office Action dated August 15, 2003 ( the "Final Office Action") properly rejects claims 1-3 under 35 U.S.C. § 103(a) over U.S. Patent 5,861,782 to Saitoh ("Saitoh"); and

II. Whether the Final Office Action properly rejects claims 4 and 5 under 35 U.S.C. § 103(a) over Saitoh in view of U.S. Patent 5,246,898 to Fujimaru et al. ("Fujimaru").

GROUPING OF CLAIMS

The rejected claims stand or fall together.

ARGUMENT

I. The Rejection of Claims 1-3.

Applicant respectfully submits that Saitoh does not render claims 1-3 obvious, because Saitoh fails to either teach or suggest a non-radiative dielectric waveguide in which the "surface of each parallel planar conductor adjacent to the dielectric strip is planar," as is required by claims 1-3.

Saitoh is directed to a nonradiative dielectric waveguide suitable for use in a transmission line, in an integrated circuit implemented in millimeter wave band equipment. (Saitoh, column 1, lines 6-9). Saitoh discloses a nonradiative dielectric waveguide constituted by forming electrically conductive films on both main surfaces of a dielectric formed of ceramics or resin. (Saitoh, column 4, lines 46-54). As a result, the overall strength of the nonradiative dielectric waveguide is low.

In contrast, the present invention discloses a nonradiative dielectric waveguide structured so as to be provided with a dielectric strip composed of ceramics or the like inside of parallel planar conductors formed of metal plates, and the dielectric strip is protected by the parallel planar conductors. As a result, the overall strength of the nonradiative dielectric waveguide is high.

According to this configuration, the nonradiative dielectric waveguide of the present invention has advantages such that, the handling in the manufacturing process becomes much easier, and in the case of being mounted on an automotive

millimeter wave radar or the like, malfunctions and failures are reduced and long-term reliability can be obtained.

Furthermore, in the nonradiative waveguide of the present invention, a chamfer is formed in a transmission direction of the dielectric strip at its edge portion. As a result, the strength of the dielectric waveguide is increased and the long-term reliability is further improved.

Accordingly, even though the nonradiative dielectric waveguide of the present invention may have characteristics similar to that of Saitoh with respect to high-frequency signal transmission, the Applicant believes that the nonradiative dielectric waveguide of the present invention offers far superior reliability.

In rejecting claims 1-3 as unpatentable over Saitoh, the Office apparently acknowledges that Saitoh does not teach the limitation that the surface of each parallel planar conductor adjacent to the dielectric strip is planar. (Final Office Action, page 3, lines 11-18). However, the Office apparently contends that one skilled in the art, at the time the invention was made would have found it obvious for the surface of the parallel planar conductor adjacent to the dielectric strip to be planar, since Saitoh, as described at lines 54-62 of column 7, intended various modifications and equivalent arrangements to be included within the spirit and scope of the invention. (Final Office Action, page 3, lines 11-18).

However, Saitoh does not teach a planar surface for the parallel planar conductor. Saitoh discloses at column 7, lines 40-46 that the sharp corners in the conductor and the dielectric in the propagation area have a curved or chamfered shape. Saitoh further discloses at column 7, lines 46-51 that since the portion of the dielectric which forms the ridge of the dielectric projecting into the conductor in the propagation area is formed with chamfered or curved corners, the concentration of an electric current in that portion can be suppressed, and transmission loss can be reduced. Therefore, Saitoh attributes a reduction in transmission loss to this non-

planar surface. The fact that Saitoh attributes an advantage to a non-planar surface of conductor, which is adjacent to the dielectric strip, clearly indicates that Saitoh does not view a planar surface of a conductor as an equivalent modification within the spirit in scope of the invention.

Therefore, without the benefit of the Appellant's disclosure, there would have been no incentive or reason for one of ordinary skill in the art to contemplate modifying the waveguide of Saitoh. In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. MPEP 2143

> "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." MPEP 2143.01

In addition, Saitoh's preferred use of non-planar surfaces teaches away from the present invention.

> "A prior art reference must be considered in its entirety, i.e., as a <u>whole</u>, including portions that would lead away from the claimed invention." MPEP 2141.02

Furthermore, in its Advisory Action of October 31, 2003, the Office merely states, "Having the parallel conductors be planar would be an obvious modification even if Saitoh disclose an advantageous benefit for the conductor not be planar." However, no citation to the art or a reasoned basis for this statement has been provided. Thus, the Office has not met its burden of providing a *prima facie* case of obviousness. MPEP 2142

> "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the references." MPEP 2142

In conclusion, claims 1-3 are submitted to clearly distinguish patentably over Saitoh, because Saitoh fails to teach or suggest a non-radiative dielectric waveguide in which the "surface of each parallel planar conductor adjacent to the dielectric strip is planar." Applicant respectfully requests that the final rejection of the claims be reversed and claims 1-3 be determined to be allowable.

II. The Rejection of Claims 4-5.

Applicant respectfully submits that Saitoh in view of Fujimaru does not render claims 4 and 5 obvious.

In rejecting claims 4 and 5 as unpatentable over Saitoh in view of Fujimaru, the Office again states that the limitation that the surface of each parallel planar conductor adjacent to the dielectric strip is planar is obvious based upon Saitoh for the same reasons discussed above. Fujimaru does not disclose a non-radiative dielectric waveguide of any kind, much less a non-radiative dielectric waveguide, wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar. The Office merely cites Fujimaru for its disclosure of an open pore ratio of 7% or less. (Final Office Action, page 4, lines 6-13).

Accordingly, claims 4 and 5 are submitted to clearly distinguish patentably over the combination of Saitoh and Fujimaru for the reasons discussed above. It is therefore respectfully requested that the final rejection of the claims be reversed and claims 4 and 5 be determined to be allowable.

The present Brief is submitted herewith in triplicate along with an Appendix containing the appealed claims and the requisite brief fee.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date: February 13, 2004

By: 
Lawrence J. McClure
Registration No. 44,228
Attorney for Applicant(s)

500 South Grand Avenue, Suite 1900
Los Angeles, California 90071
Phone: 213-337-6700
Fax: 213-337-6701

## APPENDIX: CLAIMS 1-5 ON APPEAL

1. A non-radiative dielectric waveguide comprising:

a pair of parallel planar conductors arranged at an interval of half or below of a high-frequency signal wavelength; and

a dielectric strip interposed between the parallel planar conductors, the dielectric strip having a 0.01 to 0.3 mm-wide chamfer formed at an edge portion in a transmission direction of the dielectric strip;

wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar.

2. The non-radiative dielectric waveguide of claim 1,

wherein the chamfer is formed as a flat surface, and one width of the chamfer corresponding to a surface of the dielectric strip facing to the parallel planar conductor is made larger than the other width corresponding to a side surface of the dielectric strip.

3. The non-radiative dielectric waveguide of claim 1,

wherein the chamfer is formed as a convexly-curved surface, and one width of the chamfer corresponding to the surface of the dielectric strip facing to the parallel planar conductor is made larger than the other width corresponding to the side surface of the dielectric strip.

4. A non-radiative dielectric waveguide comprising:

a pair of parallel planar conductors arranged at an interval of half or below of a high-frequency signal wavelength; and

a dielectric strip interposed between the parallel planar conductors, the dielectric strip being made of a ceramics having an open pore ratio of 5 % or less;

wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar.

5. The non-radiative dielectric waveguide of claim 4,

wherein the dielectric strip has an open pore ratio of 3 % or less.

CANCELLED

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great. This makes it impossible to provide a sharp curved portion. Moreover, even in a case where a gently-curved portion is formed, its radius of curvature needs to be determined precisely. (Applicant's specification, at p. 2, line 2-p. 3, line 4).

In addition, in an NRD guide realized by using a dielectric strip formed of a conventionally-used resin material such as Teflon, the dielectric strip and the parallel planar conductor cannot be bonded to each other with ease. Consequently, the dielectric strip is positionally deviated due to vibration or difference in thermal expansion, which results in malfunction. (Applicant's specification, at p. 3, line 21-p. 4, line 1).

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millimeter wave radar or the like, malfunctions and failures are reduced and long-term reliability can be obtained.

Furthermore, in the nonradiative waveguide of the present invention, a chamfer is formed in a transmission direction of the dielectric strip at its edge portion. As a result, the strength of the dielectric waveguide is increased and the long-term reliability is further improved.

Accordingly, even though the nonradiative dielectric waveguide of the present invention may have characteristics similar to that of Saitoh with respect to high-frequency signal transmission, the Applicant believes that the nonradiative dielectric waveguide of the present invention offers far superior reliability.

In rejecting claims 1-3 as unpatentable over Saitoh, the Office apparently acknowledges that Saitoh does not teach the limitation that the surface of each parallel planar conductor adjacent to the dielectric strip is planar. (Final Office Action, page 3, lines 11-18). However, the Office apparently contends that one skilled in the art, at the time the invention was made would have found it obvious for the surface of the parallel planar conductor adjacent to the dielectric strip to be planar, since Saitoh, as described at lines 54-62 of column 7, intended various modifications and equivalent arrangements to be included within the spirit and scope of the invention. (Final Office Action, page 3, lines 11-18).

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In conclusion, claims 1-3 are submitted to clearly distinguish patentably over Saitoh, because Saitoh fails to teach or suggest a non-radiative dielectric waveguide in which the "surface of each parallel planar conductor adjacent to the dielectric strip is planar." Applicant respectfully requests that the final rejection of the claims be reversed and claims 1-3 be determined to be allowable.

II. <u>The Rejection of Claims 4-5.</u>

Applicant respectfully submits that Saitoh in view of Fujimaru does not render claims 4 and 5 obvious.

In rejecting claims 4 and 5 as unpatentable over Saitoh in view of Fujimaru, the Office again states that the limitation that the surface of each parallel planar conductor adjacent to the dielectric strip is planar is obvious based upon Saitoh for the same reasons discussed above. Fujimaru does not disclose a non-radiative dielectric waveguide of any kind, much less a non-radiative dielectric waveguide, wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar. The Office merely cites Fujimaru for its disclosure of an open pore ratio of 7% or less. (Final Office Action, page 4, lines 6-13).

Accordingly, claims 4 and 5 are submitted to clearly distinguish patentably over the combination of Saitoh and Fujimaru for the reasons discussed above. It is therefore respectfully requested that the final rejection of the claims be reversed and claims 4 and 5 be determined to be allowable.

The present Brief is submitted herewith in triplicate along with an Appendix containing the appealed claims and the requisite brief fee.

Respectfully submitted,

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## APPENDIX: CLAIMS 1-5 ON APPEAL

1. A non-radiative dielectric waveguide comprising:

a pair of parallel planar conductors arranged at an interval of half or below of a high-frequency signal wavelength; and

a dielectric strip interposed between the parallel planar conductors, the dielectric strip having a 0.01 to 0.3 mm-wide chamfer formed at an edge portion in a transmission direction of the dielectric strip;

wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar.

2. The non-radiative dielectric waveguide of claim 1,

wherein the chamfer is formed as a flat surface, and one width of the chamfer corresponding to a surface of the dielectric strip facing to the parallel planar conductor is made larger than the other width corresponding to a side surface of the dielectric strip.

3. The non-radiative dielectric waveguide of claim 1,

wherein the chamfer is formed as a convexly-curved surface, and one width of the chamfer corresponding to the surface of the dielectric strip facing to the parallel planar conductor is made larger than the other width corresponding to the side surface of the dielectric strip.

4. A non-radiative dielectric waveguide comprising:

a pair of parallel planar conductors arranged at an interval of half or below of a high-frequency signal wavelength; and

a dielectric strip interposed between the parallel planar conductors, the dielectric strip being made of a ceramics having an open pore ratio of 5 % or less;

wherein a surface of each parallel planar conductor adjacent to the dielectric strip is planar.

5. The non-radiative dielectric waveguide of claim 4,

wherein the dielectric strip has an open pore ratio of 3 % or less.